ANTA 2003

The Second International Workshop on Active Network Technologies and Applications

Tamanoir: a software active node supporting gigabit networks

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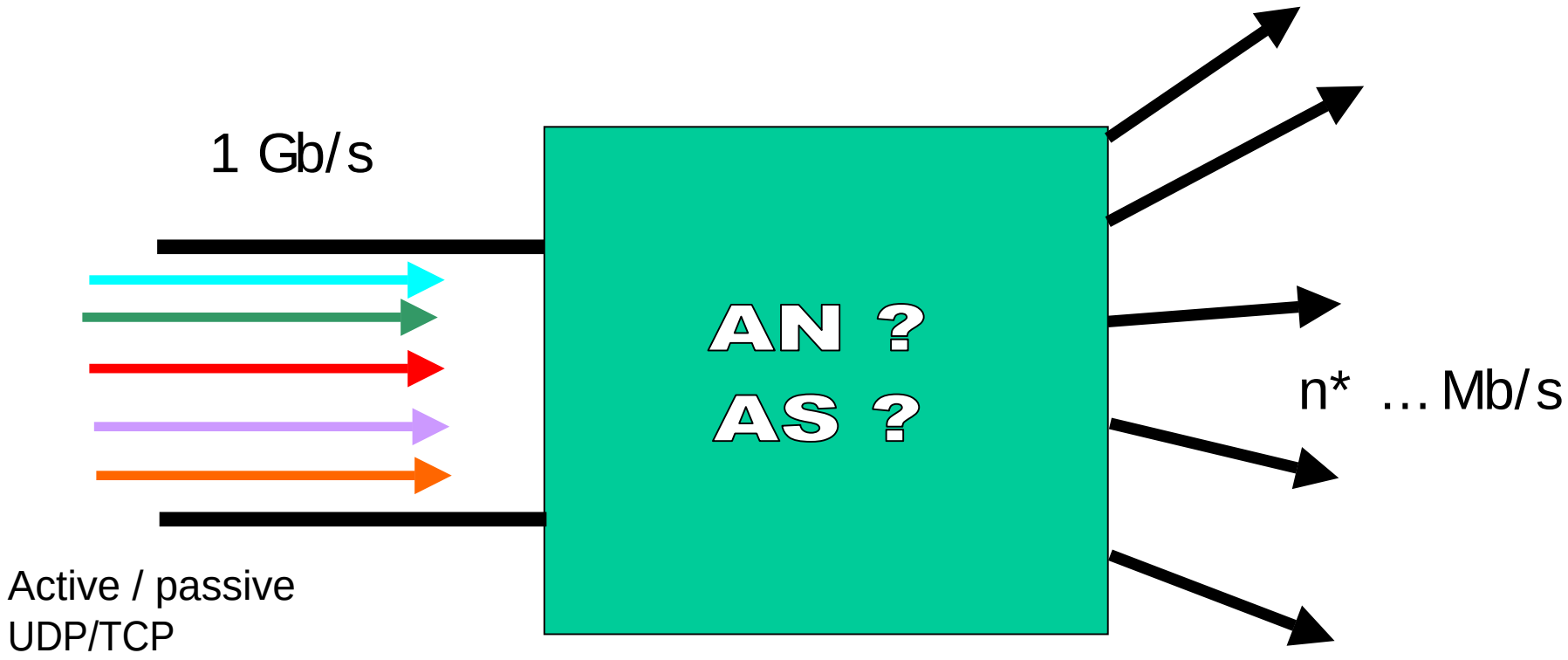
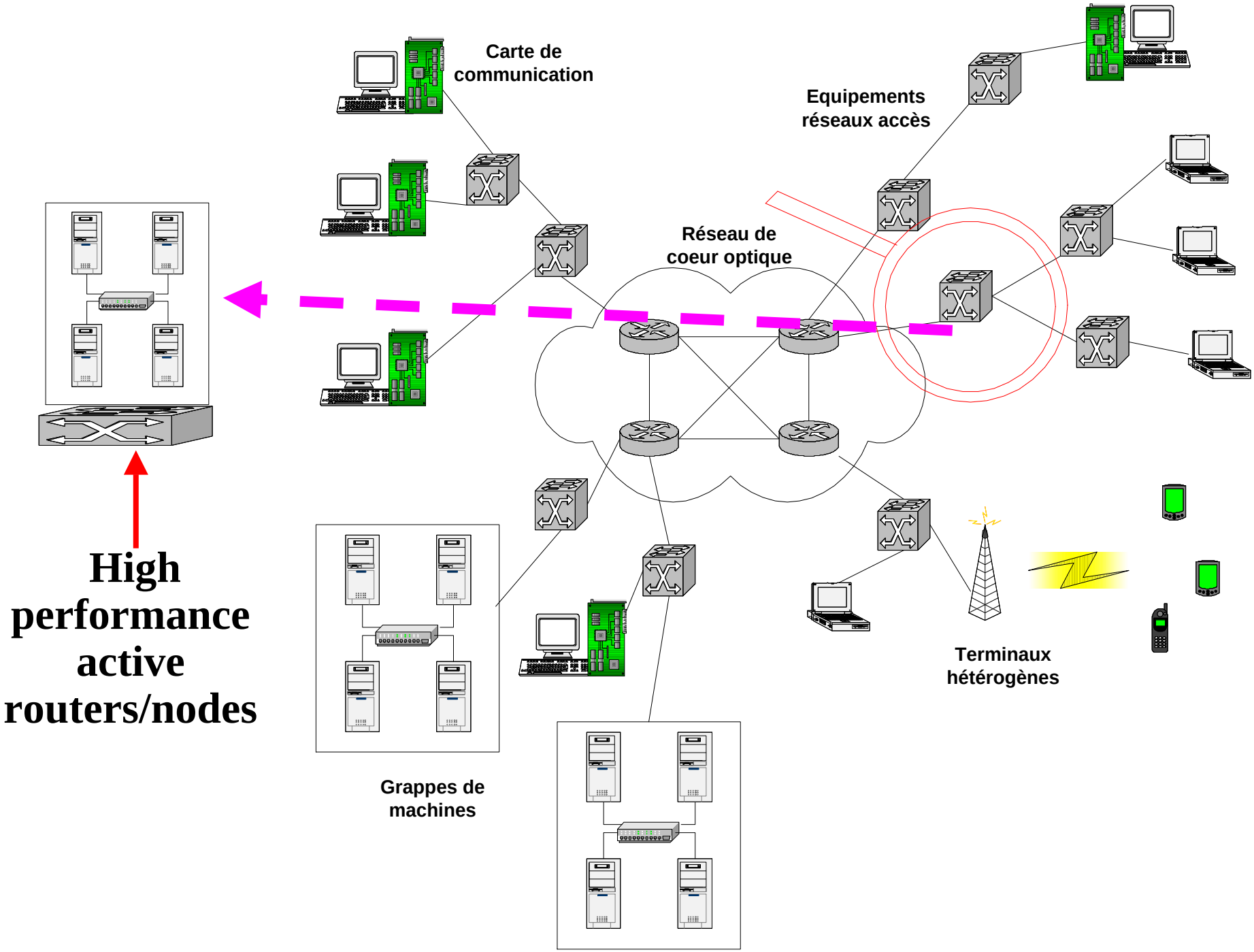
High performances in active networks

- For the moment : a few Mbit/s
- What do we need ? Performances for data transport / packets processing
  - Optimized execution environment
  - Compilation / Portability
  - Heterogeneity (OS / Networks)
  - Multi-services / scalabitlity
  - Distributed / upgradeable architecture

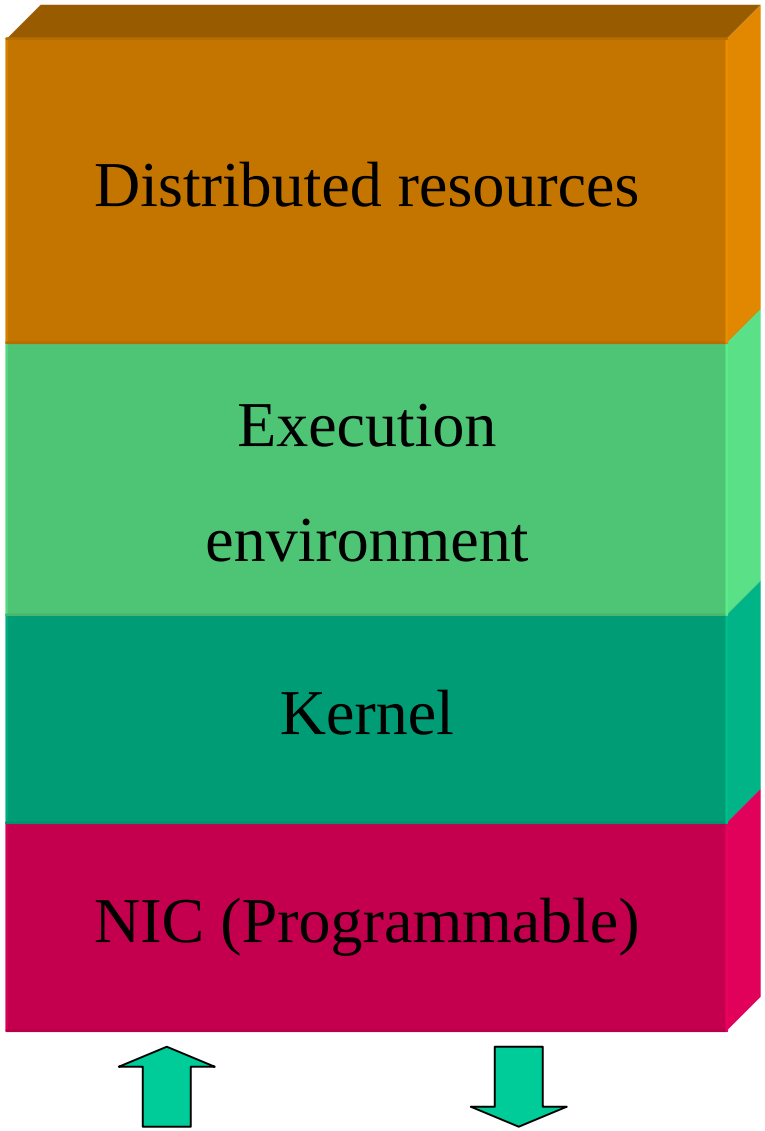
Our challenge

- High performance active node
- Passive and active packets
- Dedicated services : QoS, reliable multicast, cache…

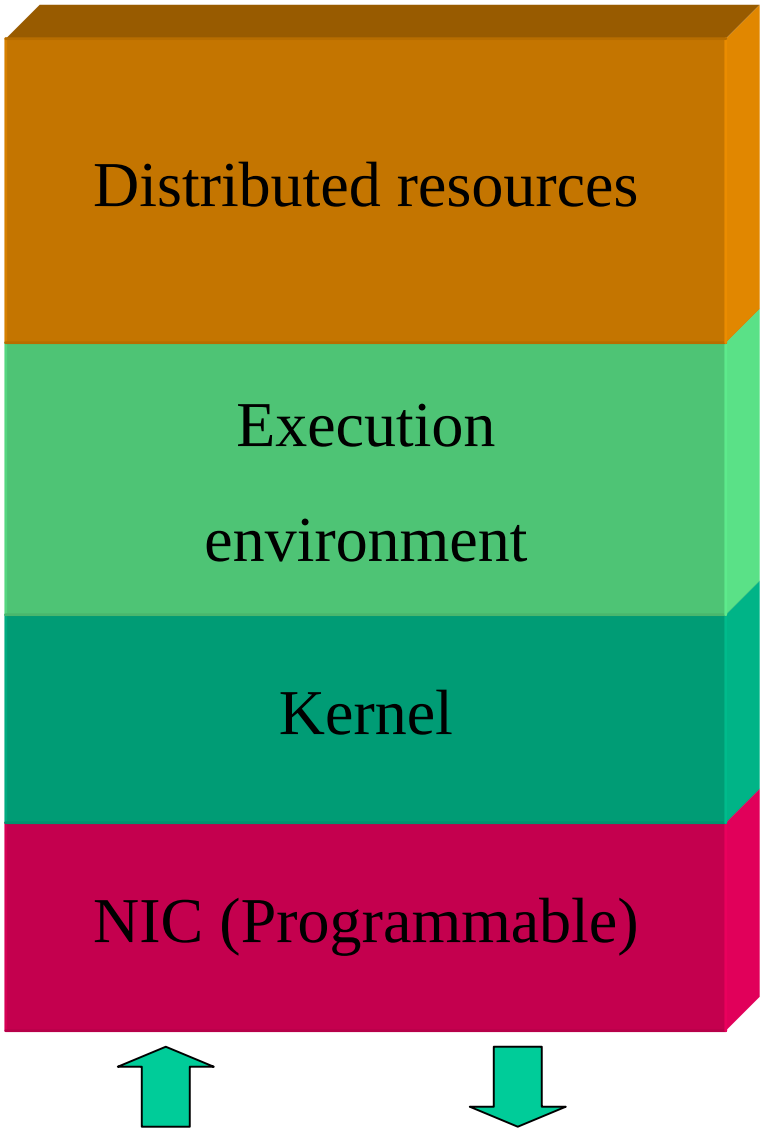



Carte de communication
Equipements réseaux accès
Réseau de coeur optique
High performance active routers/nodes
Grappes de machines
Terminaux hétérogènes

Tamanoir Architecture



Tamanoir Architecture : adapted for heterogeneous services



- Resources consuming services : distributed storage, streams adaptation, on the fly compression, cryptography…
- Services deployment / linked with middleware : reliable multicast…
- Middle services : content based routing, QoS...
- Light network services : packet marking, QoS…

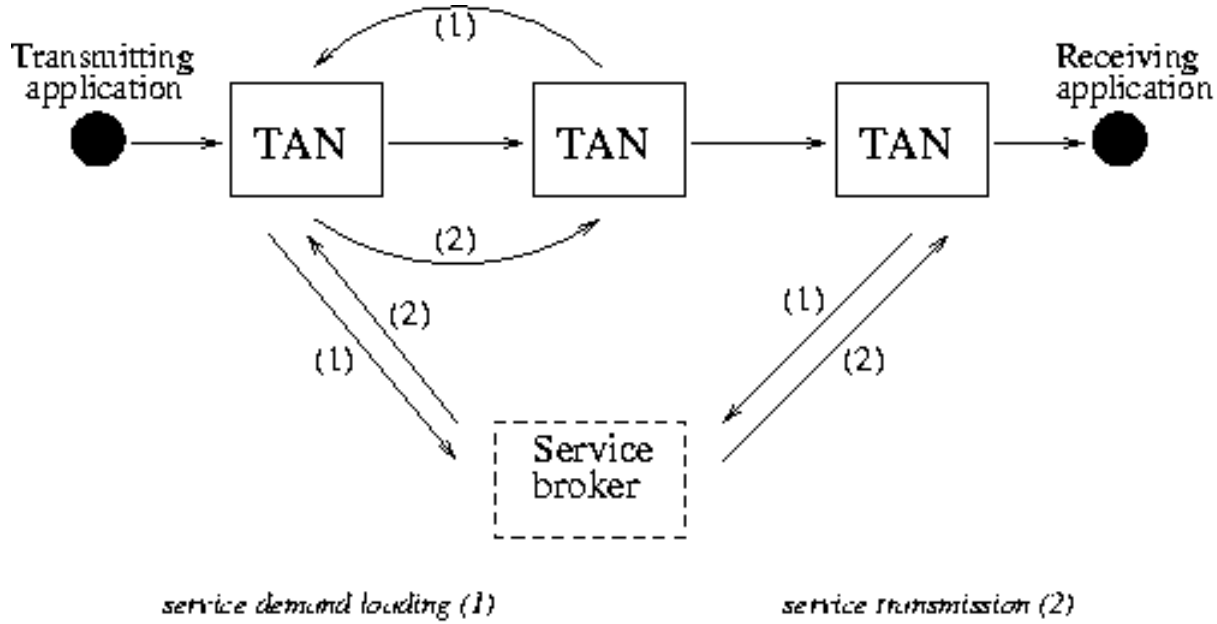
High Performance Execution Environment

High performance AN support

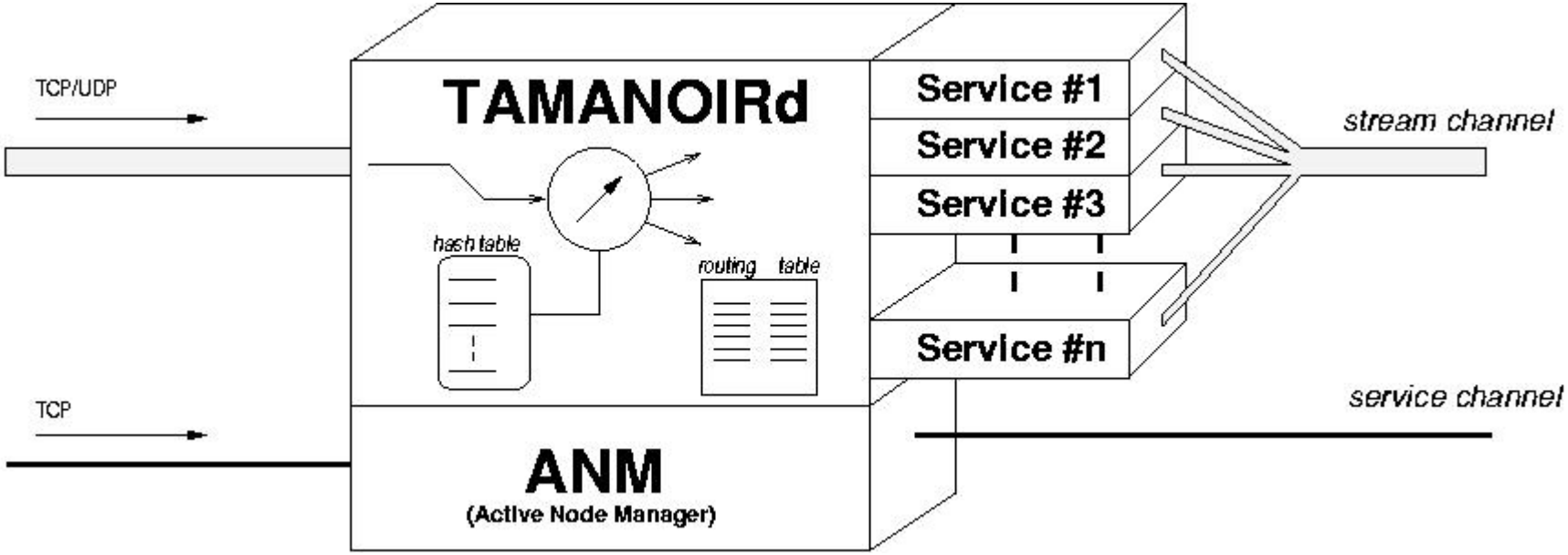
- Execution Environment based on Java
- Distributed multi-threaded architecture
- Active packets : ANEP / SAPF / service number
- Dynamic deployment of services
- Streams : UDP and TCP
- Compiled optimization (GCJ)
- Open source and freely available

Active service deployment

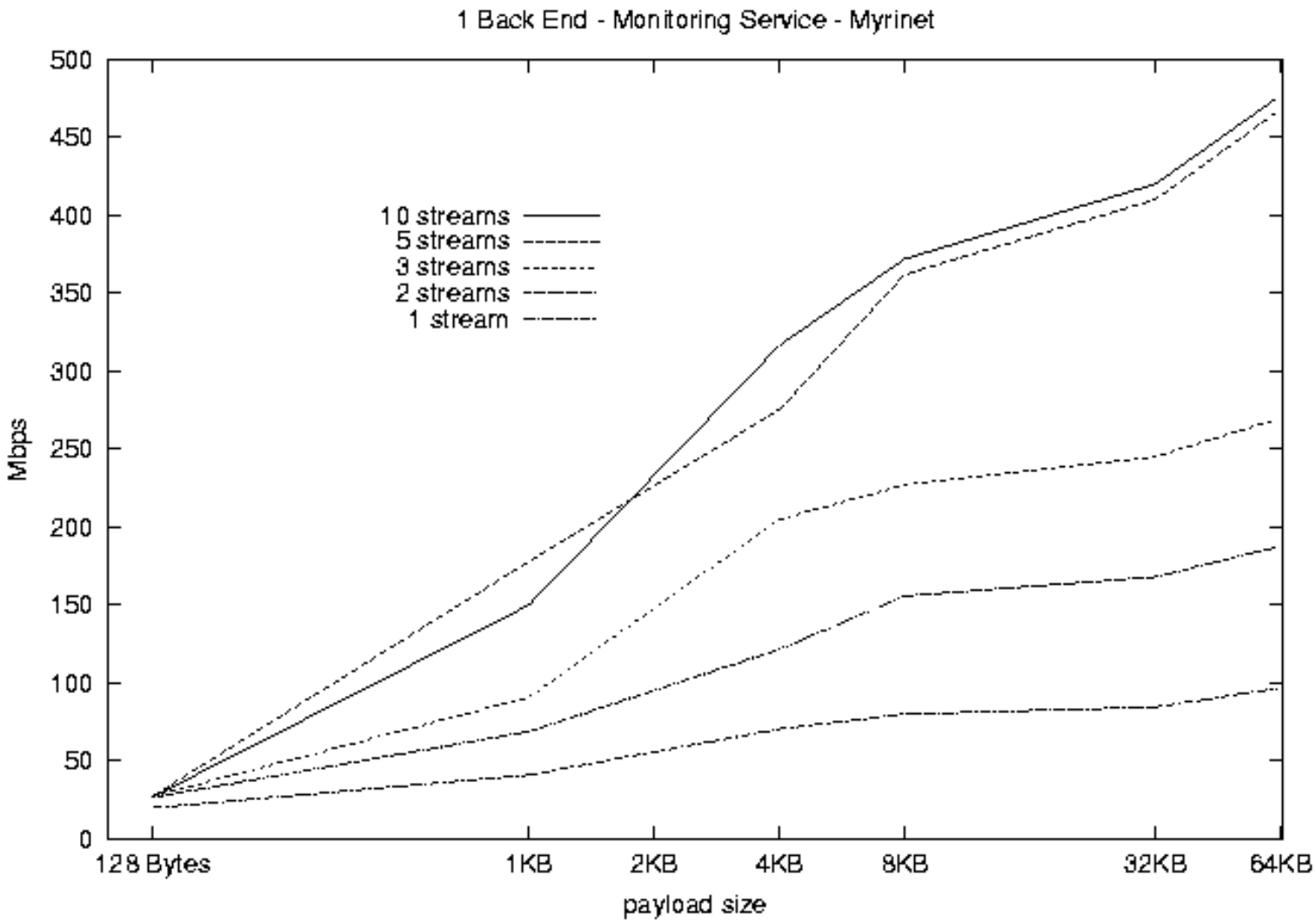
- From application / middleware
- From TAN
- From Web service Broker



Tamanoir Active Node (TAN)
Execution environment

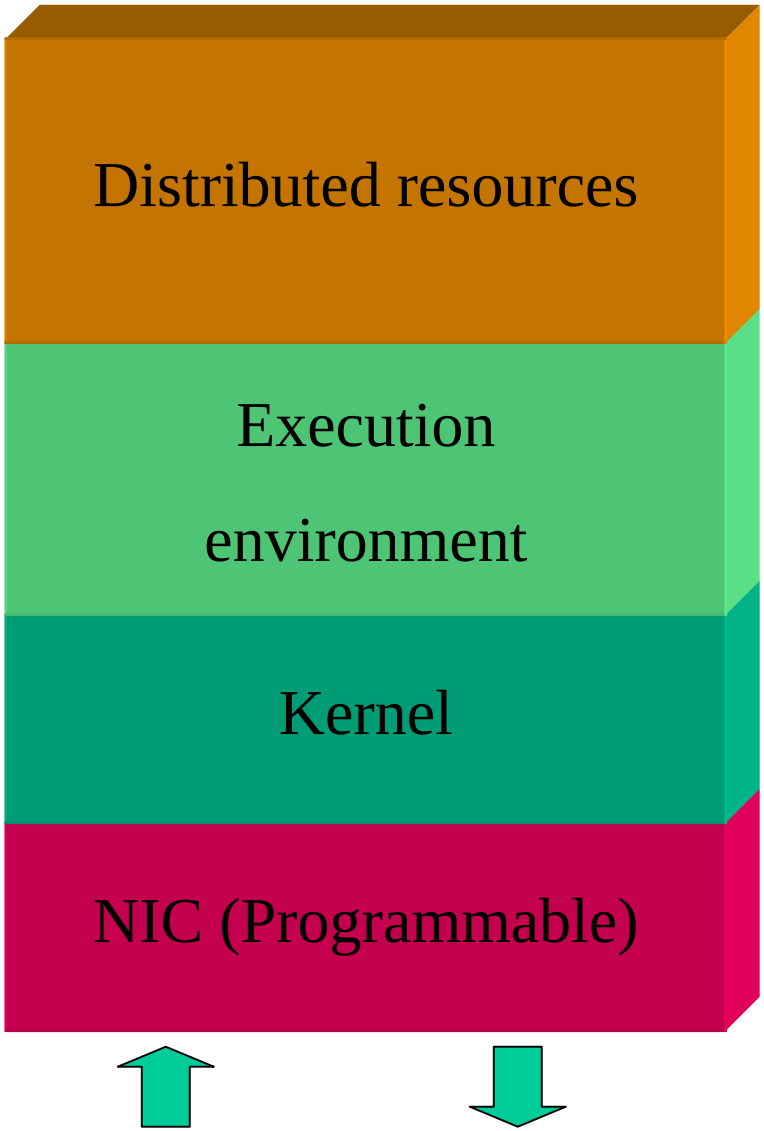


Performance evaluation of user space EE



Solution / Problem

- Simple Java service in user space can support up to 450 Mbits ! ☺ *(we eat the ants !)*
- A stand-alone active node is not enough to fully support and apply active service to Gbit streams ☹
- Need to put lightweight services close to the network
- Explore kernel services



Kernel support for active node

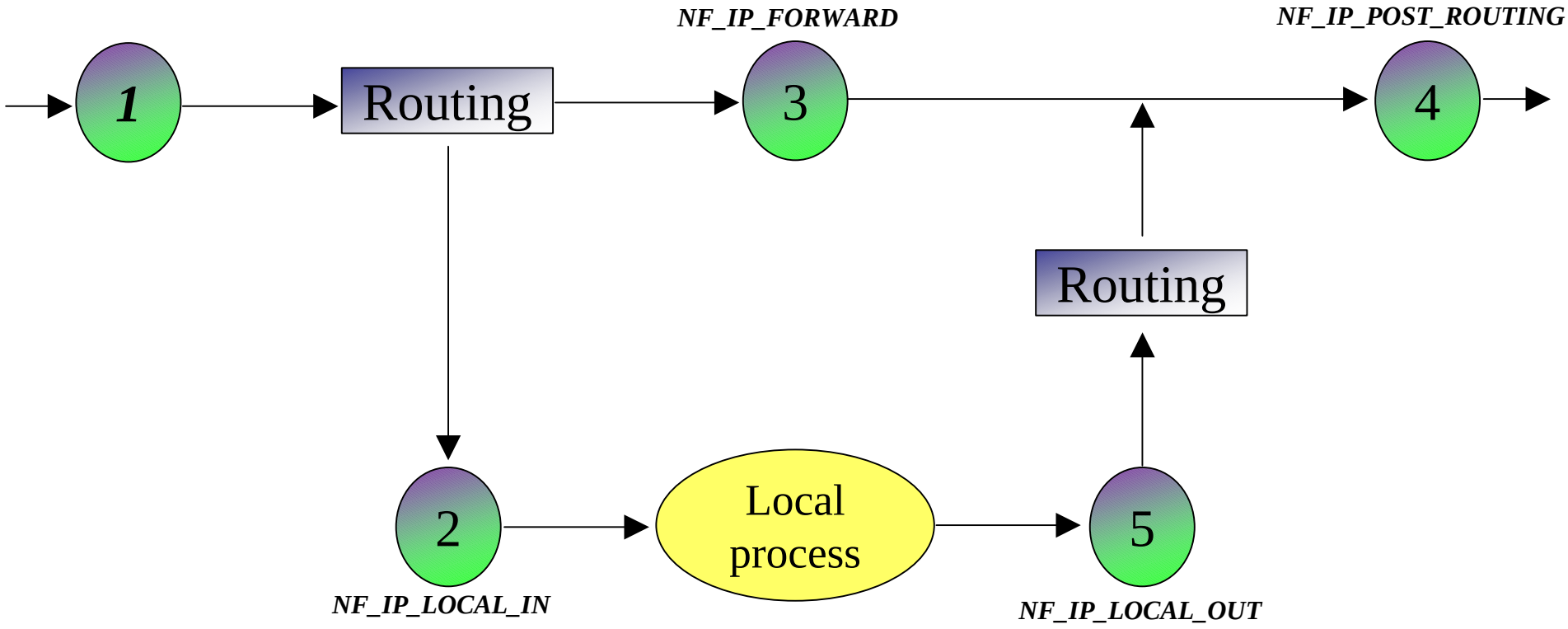
Kernel Support

- Module inside Linux kernel : using netfilter

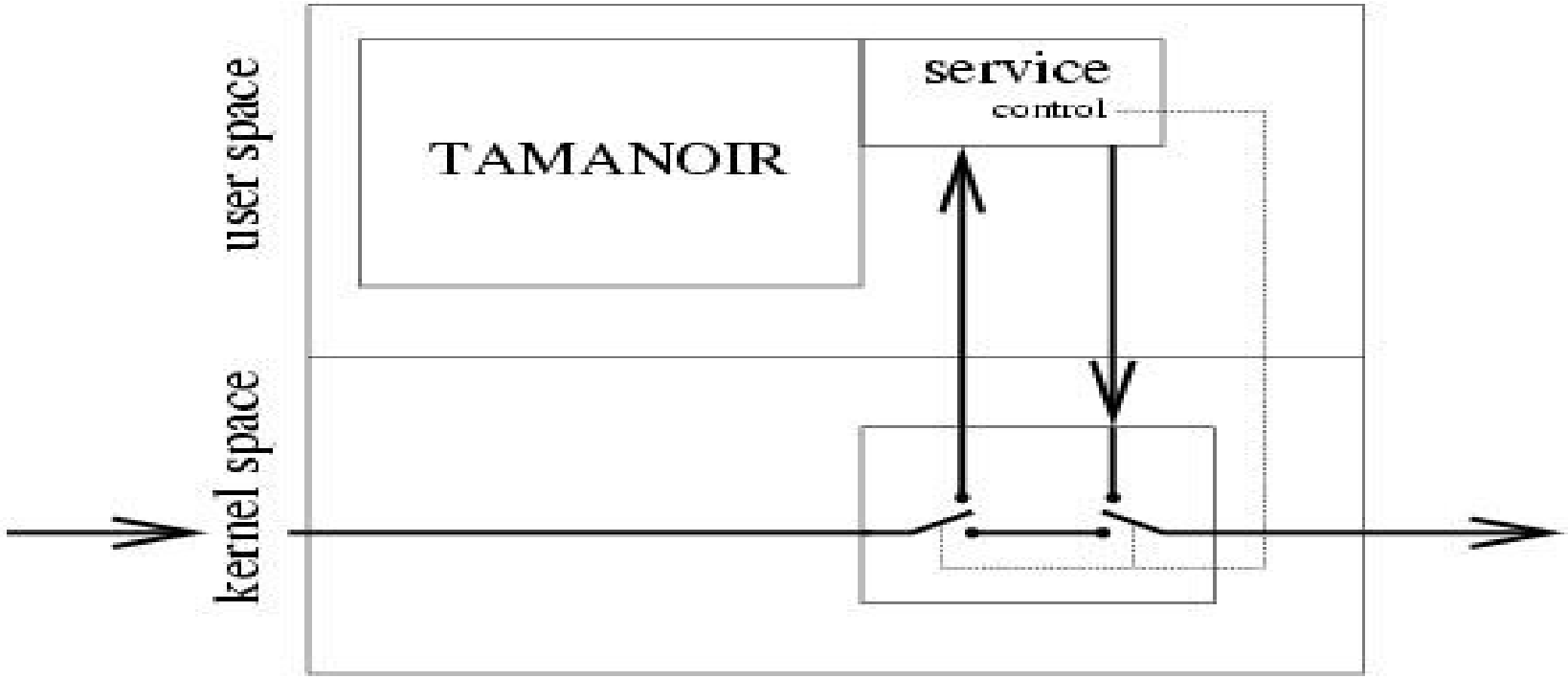
- Filtering ANEP packets
- Allowing packet to cross the active node through the kernel space
- Efficiently put ANEP packets inside the service in user space

Netfilter

- Protocols define hooks on the packet way inside IP stack
- Associate hooks and personalized applications /services

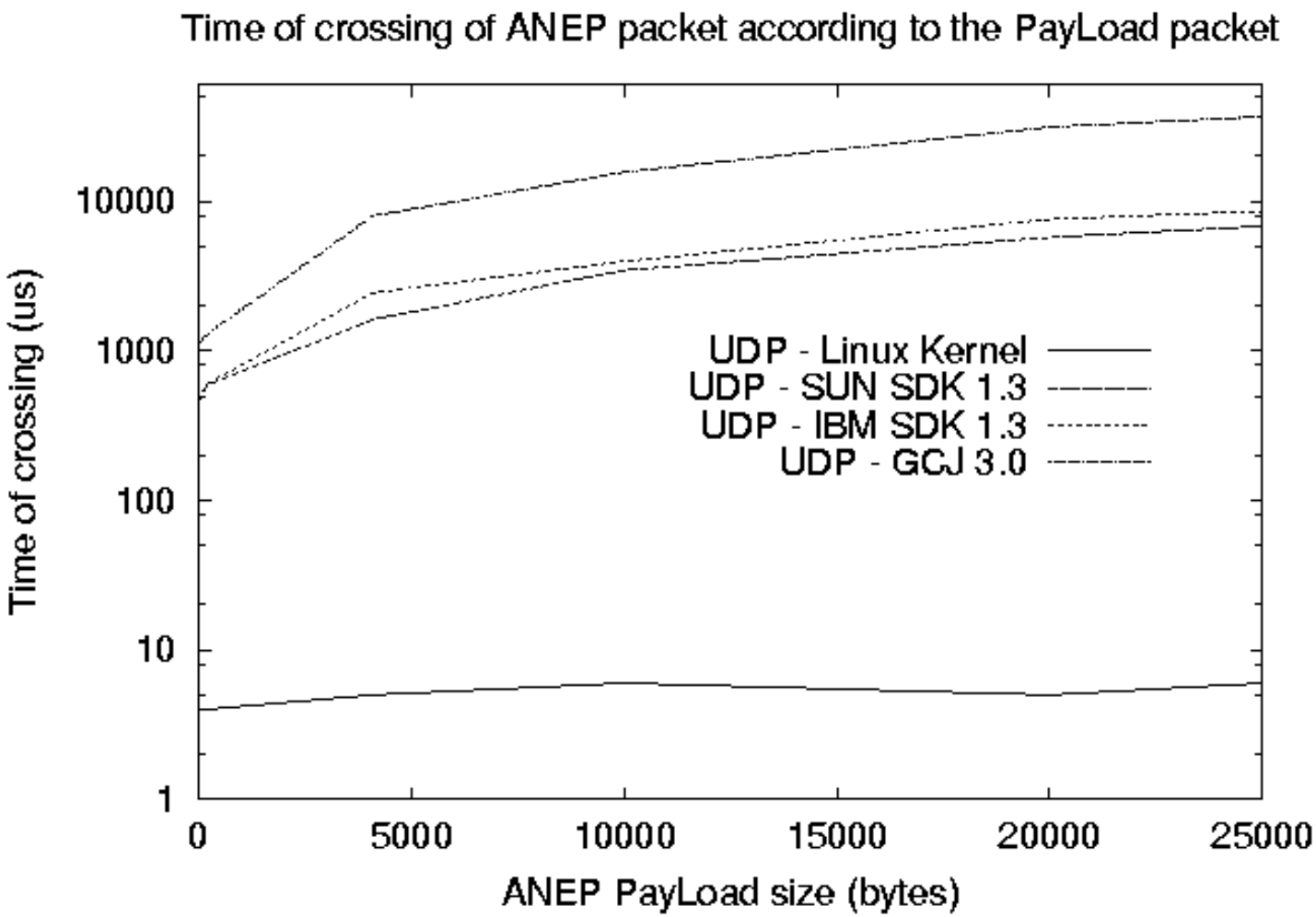


Communication between active service and OS module

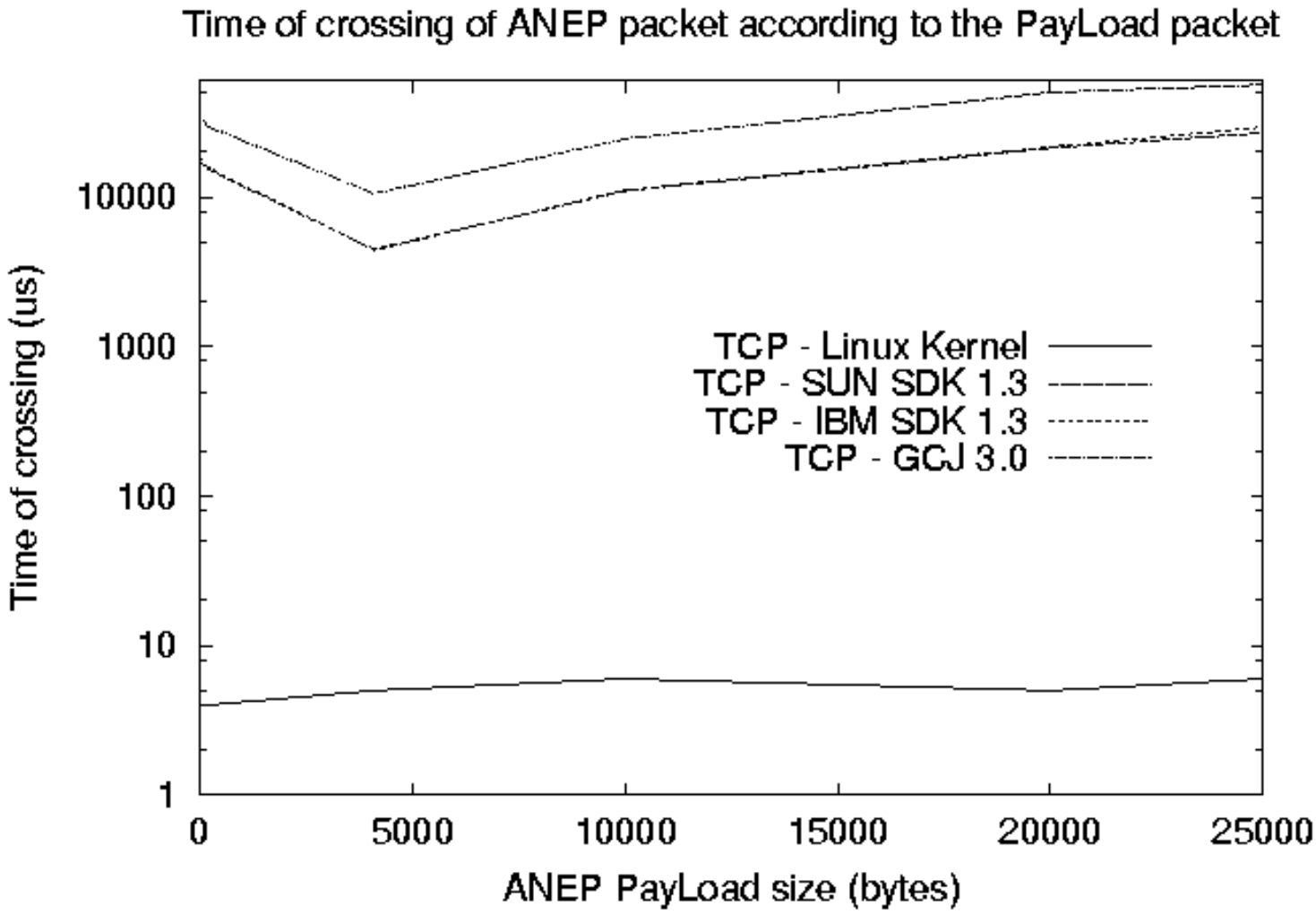


- A Tamanoir active service : a java part + kernel module
- Message control / parameters

Performance evaluation

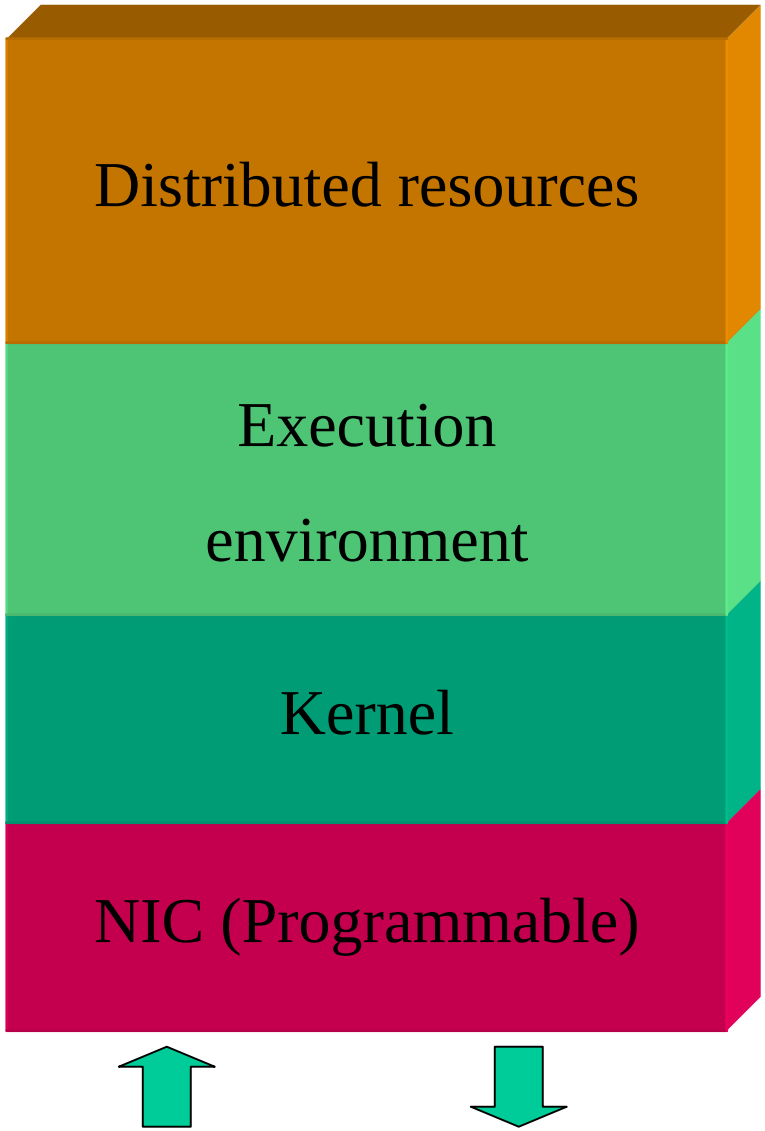


Performance evaluation



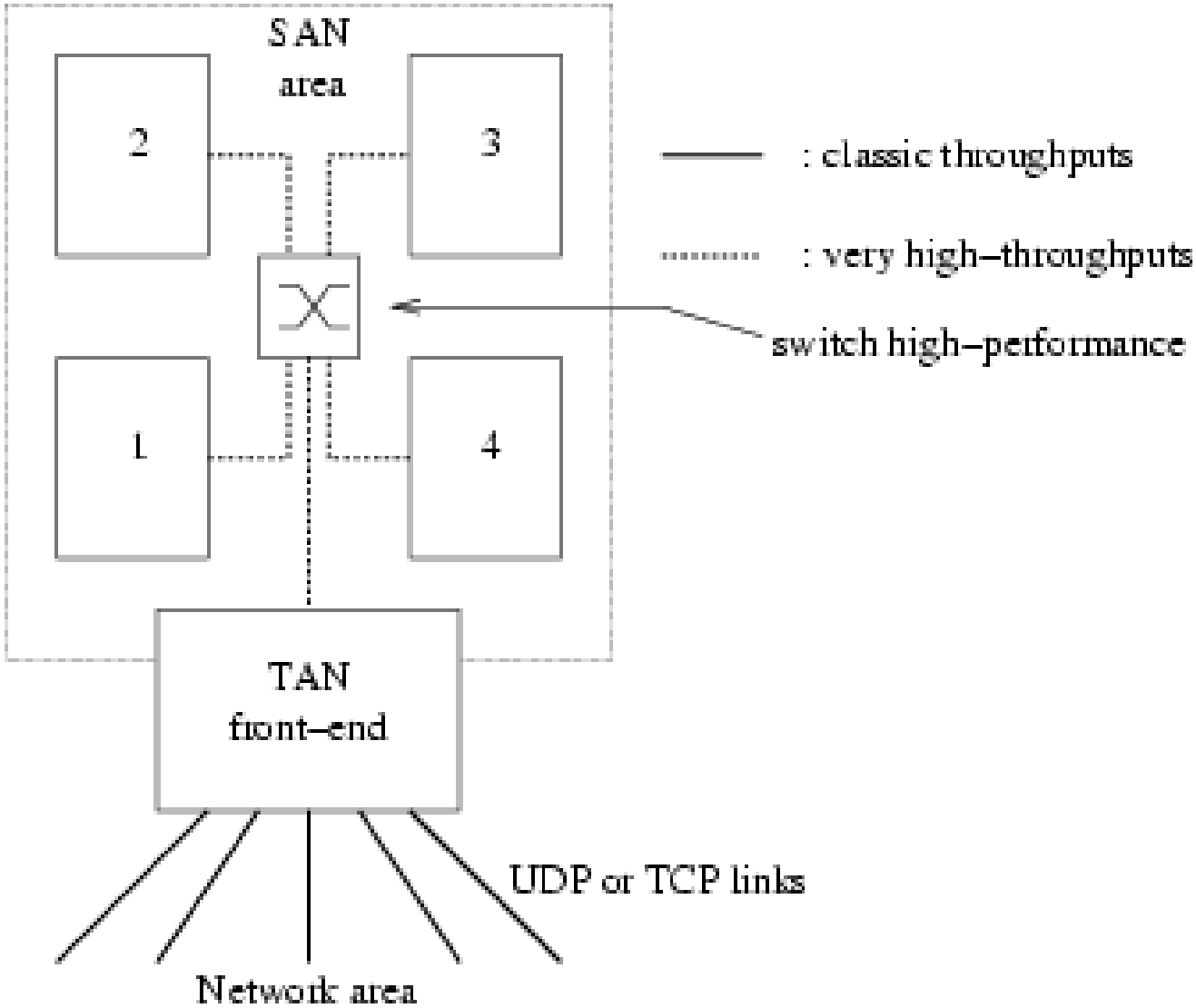
Solution / Problem

- Kernel active services greatly reduce latency for transient packets ☺
- Only applicable to lightweight services (state, CPU consumption..) ☹
- Reduce portability of active services
- What about CPU consuming services ?



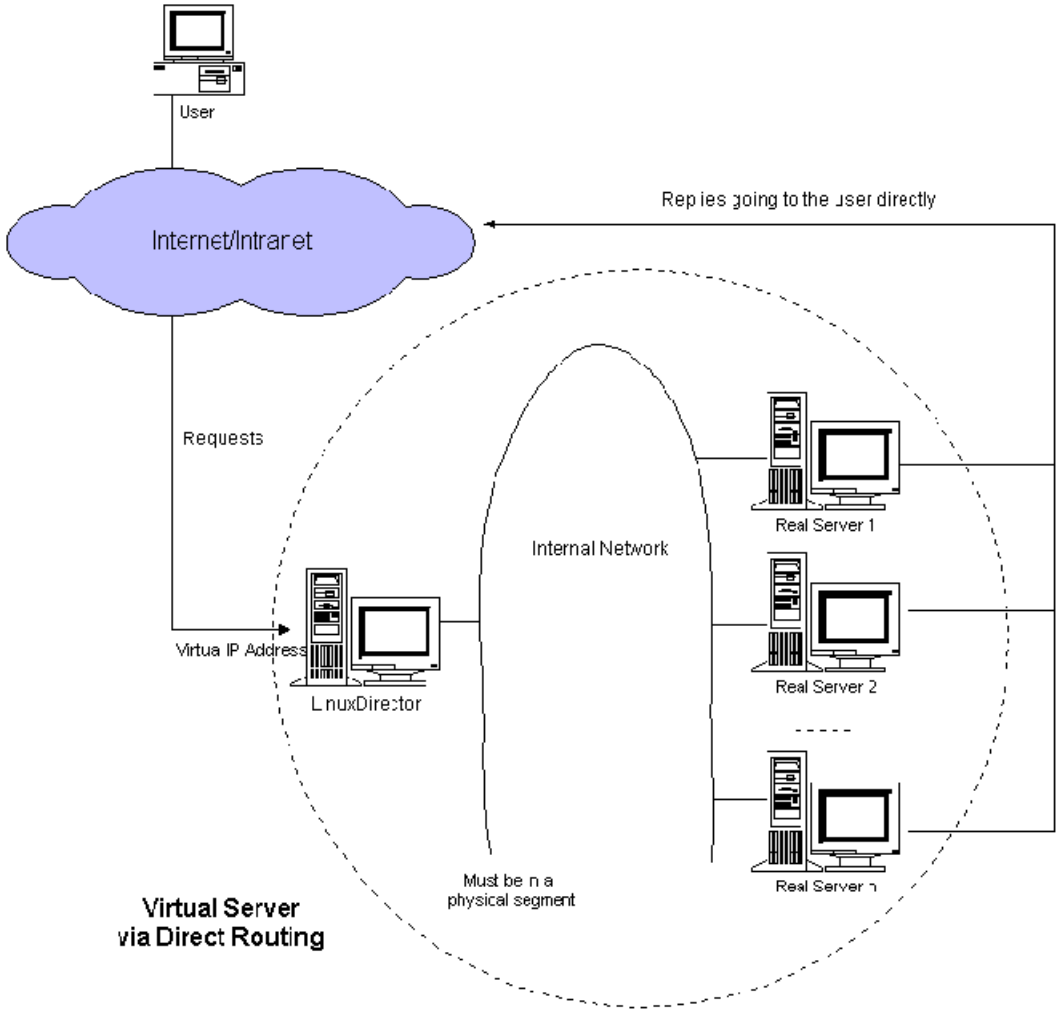
Cluster-based Tamanoir active node

Tamanoir architecture : on a cluster

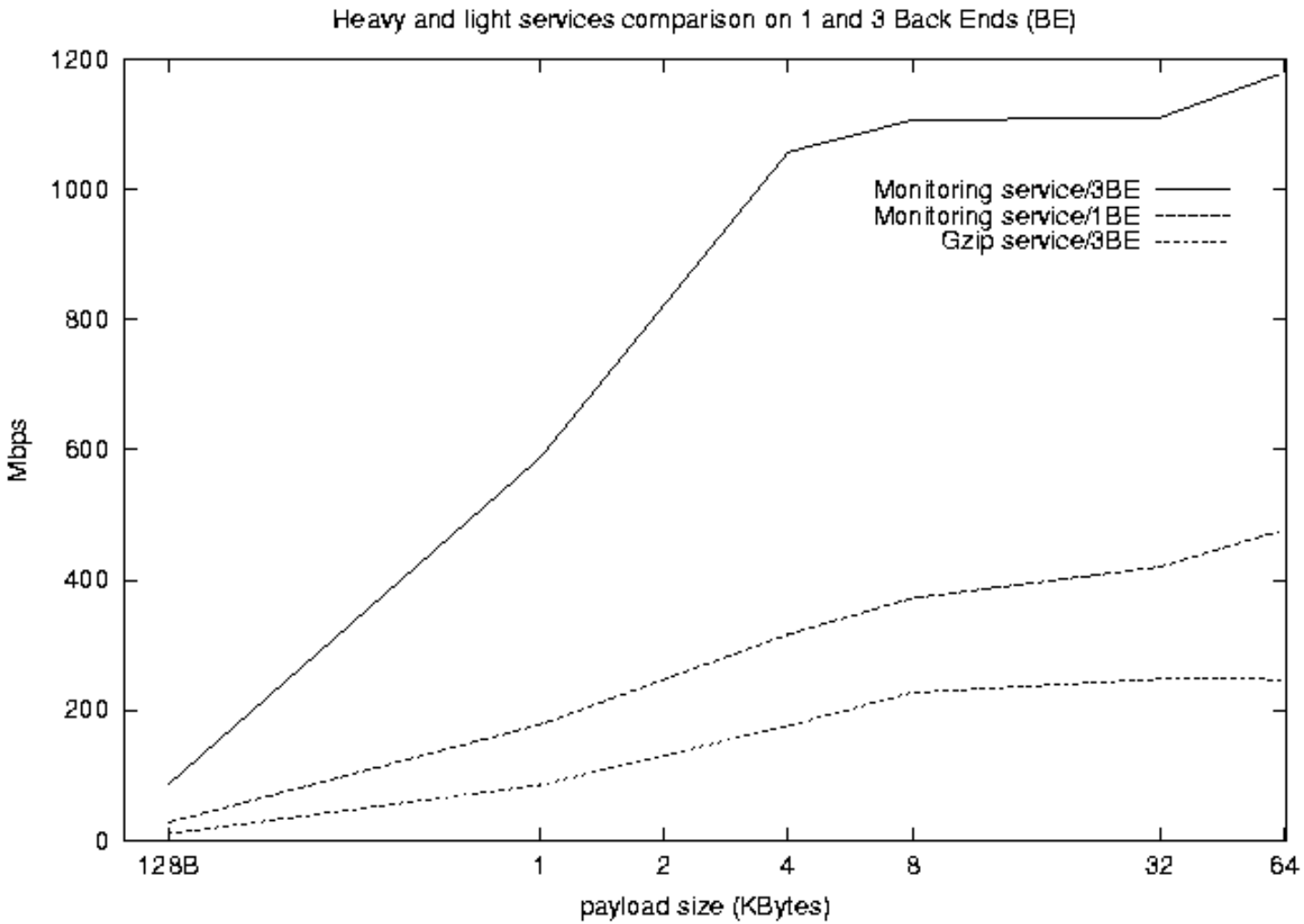


Pushing performances

- Improving performances of active nodes : using clustering technology
- Linux Virtual Server
  - NAT
  - Direct routing
  - Tunneling



Performance evaluation



Solution / Problem

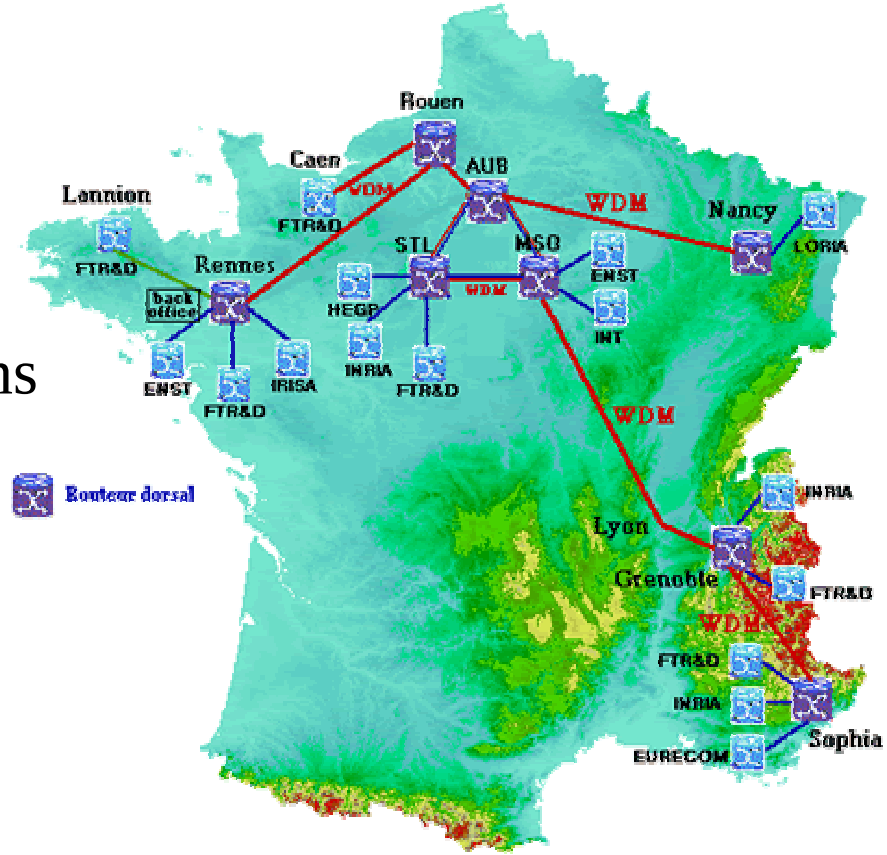
- We support a full Gbit streams with a small cluster based Tamanoir active node ! ☺
- We need more resources for CPU consuming active services
- How to balance workload between internal nodes of a TAN without knowing length of streams and needed services ? *(work in progress..)*

Where do we deploy high performance active nodes ?

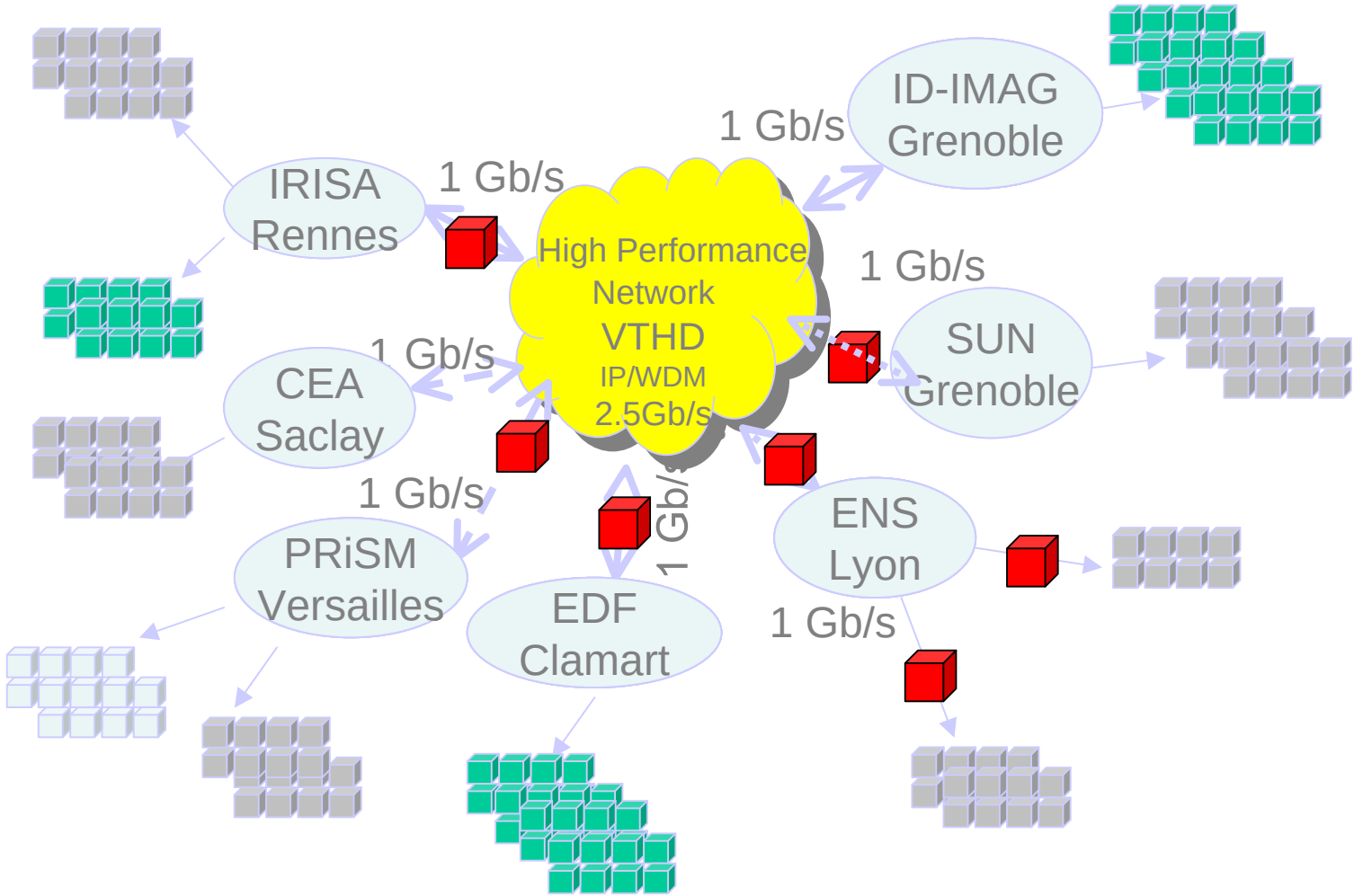
Tamanoir testbed around HP backbone

- RNRT VTHD project (Very high speed network) ***(http://www.vthd.org)***

- Deploying high performance active node around wide area backbone (2.5 Gbit/S, 1 GEth)
- Supporting wide area applications (grid and multimedia applications)
- Development of :
  - wide area visualization tools for active node management,
  - Distributed and P2P active traffic generator



Tamanoir Active Grid support



« Active Grid : an intelligent and dynamic network which supports Grid middlewares and applications with adapted services »

Conclusions and future works

- Providing performances inside active equipments is a mandatory aspect
- We propose a gigabit supporting software based active node using kernel module deployment and cluster solutions
- More to do on programmable network interface cards and mix of cluster and kernel services
- Load balancing technics to efficiently deploy lightweight and heavy services on cluster based Tamanoir nodes
- Research could also benefit for network processors technology

To know more …

- Tamanoir:

  http://www.ens-lyon.fr/~jpgelas/TAMANOIR

- Questions ?

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